

FORM PTO-1390 (Modified)
(REV 10-95)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

72005-7

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

09/355635

INTERNATIONAL APPLICATION NO.
PCT/GB98/00305INTERNATIONAL FILING DATE
2 February 1998PRIORITY DATE CLAIMED
1 February 1997

TITLE OF INVENTION

CEMENTITIOUS COMPOSITIONS AND THEIR USE IN CORROSION PROTECTION

APPLICANT(S) FOR DO/EO/US

CONROY, Paul James; NEUMAN, John Brian; HUDSON, Lisa Anne

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 18 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
A **SECOND** or **SUBSEQUENT** preliminary amendment.
16. ☐ A substitute specification.
17. ☐ A change of power of attorney and/or address letter.
18. ☐ Certificate of Mailing by Express Mail
19. ☒ Other items or information:

Copy of WO 98/33749, Dated 6 August 1998

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INTERNATIONAL APPLICATION NO.

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20. The following fees are submitted.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

- ☒ Search Report has been prepared by the EPO or JPO \$840.00
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) \$670.00
- ☐ No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) \$760.00
- ☐ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$970.00
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) \$96.00

ENTER APPROPRIATE BASIC FEE AMOUNT =**CALCULATIONS PTO USE ONLY**

\$840.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).

\$0.00

| CLAIMS | NUMBER FILED | NUMBER EXTRA | RATE |
|--------------------|--------------|--------------|-----------|
| Total claims | 29 - 20 = | 9 | x \$18.00 |
| Independent claims | 2 - 3 = | 0 | x \$78.00 |

\$162.00

\$0.00

Multiple Dependent Claims (check if applicable). ☐

\$0.00

TOTAL OF ABOVE CALCULATIONS =

\$1,002.00

Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable). ☐

\$0.00

SUBTOTAL =

\$1,002.00

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).

\$0.00

TOTAL NATIONAL FEE =

\$1,002.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). ☐

\$0.00

TOTAL FEES ENCLOSED =

\$1,002.00

Amount to be:

refunded \$

charged \$

☒ A check in the amount of \$1,002.00 to cover the above fees is enclosed.

☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees.
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **23-0575** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

WATSON COLE GRINDLE WATSON, P.L.L.C.
1400 K Street, N.W.
10th Floor
Washington, DC 20005

SIGNATURE

Richard H. Tushin

NAME

27,297

REGISTRATION NUMBER

August 2, 1999

DATE

72005-7

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE



In re Application of:) PATENT
)
Paul James CONROY et al.) Group: Unknown
)
Serial No: New appln. based on) Examiner: Unknown
PCT/GB98/00305)
)
Filed: Concurrently Herewith)
) ATTN: BOX PCT
CEMENTITIOUS COMPOSITIONS AND)
THEIR USE IN CORROSION PROTECTION)

* * * * *

PRELIMINARY AMENDMENT

Washington, D.C.
August 2, 1999

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Concurrently with the U.S. national phase filing of this
application, please amend the present application as follows:

IN THE SPECIFICATION:

Page 1, before line 4, insert

--BACKGROUND OF THE INVENTION

FILED OF THE INVENTION--;

between lines 5 and 6, insert

--THE PRIOR ART--

between lines 19 and 20, insert

--SUMMARY OF THE INVENTION--.

Page 5, between lines 6 and 7, insert

--BRIEF DESCRIPTION OF THE DRAWINGS--;

between lines 11 and 12, insert

--DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS--.

IN THE CLAIMS:

Amend claims 3, 5-8, 10, 12-14, 16-19, 22, 23, 25-29 as follows:

Claim 3 (Amended) line 1, delete "or 2".

Claim 5 (Amended) line 1, delete "3 or".

Claim 6 (Amended) line 1, delete "3, 4 or".

Claim 7 (Amended) line 1, delete "3, 4, 5 or".

Claim 8. (Amended) A method according to [any one of claims 2 to] claim 7, wherein the cementitious composition further comprises a cement replacement material in an amount of not more than 70 parts by weight, based on the dry composition.

Claim 10. (Amended) A method according to [any one of claims 2] claim 9, wherein the cement is a hydraulic cement.

Claim 12 (Amended) line 1, delete "any preceding" and after "claim" insert --1--.

Claim 13 (Amended) line 1, delete "any preceding" and after "claim" insert --1--.

Claim 14 (Amended) line 1, delete "any preceding" and after "claim" insert --1--.

Claim 16 (Amended) line 1, delete "any preceding" and after "claim" insert --1--.

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Claim 17 (Amended) line 1, delete "any preceding" and after "claim" insert --1--.

Claim 18 (Amended) line 1, delete "any preceding" and after "claim" insert --1--.

Claim 19 (Amended) line 1, delete "any preceding" and after "claim" insert --1--.

Claim 22 (Amended) line 1, delete "20 or".

Claim 23 (Amended) line 1, delete "20, 21, or".

Claim 25. (Amended) A composition according to [any one of claims] claim 20 [to 24], wherein the cement is calcium silicate cement.

Claim 26. (Amended) A composition [any one of claims 20 to] according to claim 25, further comprising aggregate and/or fibre reinforcement.

Claim 27. (Amended) A composition according [any one of claims] to claim 20 [to 26], further comprising not more than 50 parts by weight water, based on the wet composition.

Claim 28. (Amended) A cementitious mortar composition comprising a mixture of cementitious composition according to [any one of claims] claim 20 [to 27] and with sand.

Claim 29. (Amended) A pipe comprising a hollow metallic conduit and a coating provided on an internal and/or external surface to the conduit, wherein the coating comprises a composition according to [any one of claims 20 to 28] claim 20.

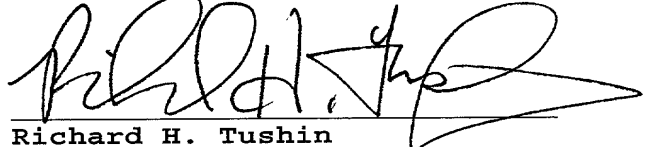
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REMARKS

By this Preliminary Amendment the specification has been amended to include topic headings and the claims have been amended to remove multiple dependencies. Entry is in order.

Respectfully submitted,



Richard H. Tushin

Registration No. 27,297

RHT:kgj

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CEMENTITIOUS COMPOSITIONS AND THEIR USEIN CORROSION PROTECTION

5 The present invention relates to cementitious compositions, and relates to the use of such compositions in corrosion protection.

10 The corrosion of metals in contact with water occurs by an aqueous electrochemical mechanism. This involves the presence of water containing dissolved ions at the metal surface, and the corresponding transfer of the electrons from the metal surface to the aqueous environment in contact with it. Corrosion protection involves interfering with these processes.

15 Current internal protection systems for water pipes usually consist of either cement mortars or epoxy resin polymeric coatings. Cement mortars suffer from a number of problems, such as lime leaching when placed in low alkalinity and low hardness waters. This results in impaired water quality by increasing the pH (ie the alkalinity) and calcium concentrations, and causes structural deterioration of the cement mortar, which results in poor durability. Epoxy resins can also suffer from a number of problems: if they are insufficiently cured, then there may be problems with water quality; there may be blistering; and there may be poor coverage at pipe joints.

20 We have now found a way to improve corrosion protection of metal surfaces, such as metallic drinking water pipes. We achieve this by providing a cementitious composition which, in the hardened state, acts as a low leaching and durable coating in low alkalinity and low hardness waters.

25 According to one aspect of the invention there is provided a method of protecting a surface from corrosion, comprising applying to the surface a cementitious composition which, in the hardened state, acts as a low leaching coating in low alkalinity and low hardness waters.

30 The method can be used to protect a wide variety of surfaces from corrosion. The method is of particular use in preventing the corrosion of metal pipes from corrosion caused by moisture. The method has particular application to the protection of the inside of drinking water pipes.

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After the cementitious composition has been applied to the surface it can be left to harden. In general sufficient hardening will occur within about 24 hours, but it may take several weeks for the composition to finish curing.

The thickness of the composition depends upon the application.

- 5 Typically the composition would be applied to a thickness in the range 2 to 16 mm, and usually the thickness would be in the range 4 to 8 mm.

- The cementitious composition advantageously comprises at least one cement and a component which is capable of reacting with free lime. This reduces the amount of lime available to leach. Advantageously, the cementitious
10 composition comprises at least one hydraulic cement and a highly reactive pozzolan - the pozzolan is capable of reacting with the free lime.

- It is preferred that the composition comprises not more than 50 parts by weight pozzolan, based on the weight of the dry composition, and not less than 5 parts by weight pozzolan based on weight of the dry composition. It is more
15 preferred that the composition comprises not more than 30 parts by weight pozzolan, based on the weight of the dry composition.

- In one embodiment, the cementitious composition may further comprise a cement replacement material, preferably in an amount of not more than 70 parts by weight, based on the dry composition. The cement replacement material
20 assists in producing a dense cement with a fine pore structure in the hardened cement paste. The cement replacement material is preferably ground granulated blast furnace slag (GGBFS - available from Civil and Marine Slag Cement Limited), activated blast furnace slag, pulverised fuel ash (PFA - available from Pozzolan Lytag) and/or microsilica powder (e.g. grade 940U available from Elkem Materials).

- 25 In certain embodiments, the composition may comprise not more than 10 parts by weight pozzolan, based on the dry composition. For example, when the cement replacement material is provided, it is preferred that the composition comprises not more than 10 parts by weight pozzolan, based on the dry composition.

- 30 A wide variety of cements may be used. Ordinary Portland cement (OPC) has been found to be very suitable. Examples of three commercially

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available cements that are suitable for use with the present invention are: ordinary Portland cement to B.S. 12:1991 class 42.5N; Ferrocrete which is a rapid-hardening Portland cement to B.S. 12:1991 class 52.5N; and Sulfacrete which is a sulphate resisting Portland cement to B.S. 4027:1991 class 42.5N. All three of these cements
5 are available from Blue Circle Industries.

The cement may be a Microcem cement, i.e., a superfine Portland cement having a greater surface area than conventional Portland cements. Microcem 550, Microcem 650SR or Microcem 900 may, for example, be used in the invention.

10 In an embodiment, the cement is a hydraulic cement. The hydraulic cement is preferably calcium silicate cement.

Pozzolans are silaceous and aluminous materials, such as certain fly ashes and blast furnace slags, which, in finely divided form, will exhibit cementitious properties when mixed with, for example, lime and water. We prefer to use a highly
15 reactive pozzolan. We have obtained exceptionally good results when the pozzolan is metakaolin. Metakaolins can be formed from Kaolinite ($\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$) by heating, for example to about 500°C to about 800°C . Metakaolin is available from, for example, English China Clay International. Grade Metastar 501, available from English China Clay International, has been found to be very suitable.

20 The cementitious composition used in the method according to the invention may comprise other materials, such as aggregate and a reinforcement material such as a fibre reinforcement. The aggregate would typically be a fine grade silver sand having a moisture content of, for example, 4.7%. The reinforcement may be a polymeric fibre and may be present in an amount up to 40
25 parts by weight, based on the total weight of the dry composition.

The cementitious material may include other materials, such as silica fume.

In general, the cementitious composition according to the invention is mixed with water before use. This results in the formation of a cement paste. We
30 prefer that the composition comprises not more than 50 parts by weight water, based on the wet composition.

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The composition may be mixed with sand in order to form a cementitious mortar. This cementitious mortar may then be applied to the surface to be protected. In general, the amount of sand will be about the same as the amount of cement.

5 In accordance with the invention a particularly preferred cementitious composition comprises:

| | | |
|----|-------------|--------------|
| | Metakaolin: | 5 to 15 wt% |
| | OPC: | 10 to 30 wt% |
| 10 | GGBFS: | 60 to 80 wt% |

The most preferred cementitious composition comprises:

| | | |
|----|-------------|--------|
| | Metakaolin: | 10 wt% |
| 15 | OPC: | 20 wt% |
| | GGBFS: | 70 wt% |

20 A particularly effective cement mortar composition would comprise 1 part by weight of the cement composition with 1 part by weight sand and 0.35-0.55, preferably 0.40 to 0.45 parts by weight water.

According to another aspect of the invention there is provided a cementitious composition which, in the hardened state, acts as a low leaching coating in low alkalinity and low hardness waters.

25 Advantageously, the cementitious composition comprises at least one cement and a component that is capable of reacting with free lime, which component is preferably a highly reactive pozzolan.

Preferably, the composition comprises not more than 30 parts by weight pozzolan, based on the dry composition, and the composition comprises not less than 5 parts by weight pozzolan, based on the dry composition.

30 The cementitious composition according to this aspect of the invention may be provided with any combination of the features of the cementitious

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composition described in relation to the method of protecting a surface from corrosion protection. The cementitious composition may be mixed with sand to form a cementitious mortar composition.

5 The method and composition according to the present invention make it possible to protect pipes, especially drinking water pipes, from corrosion, without the usual problems associated with cement mortars or epoxy resins.

Reference is now made to the accompanying drawings, in which:

Fig. 1 is a cross-sectional view of a flat surface that has been treated with a cementitious composition according to the invention; and

10 Fig. 2 is a cross-sectional view of a pipe that has been treated with a cementitious composition according to the invention.

In Fig. 1 a substantially planar metallic substrate 10 has been coated with a layer 12 of a cementitious composition comprising a hydraulic cement, a pozzolan and water. The cementitious composition was applied in the form of a paste to form the layer 12 and was then left to set. The cementitious material cured while in contact with the metallic substrate 10 and provides an alkaline environment in contact with the surface of the substrate 10. Once fully cured, the cementitious coating protects the substrate 10 from electrochemical corrosion and also from leaching of the cement by drinking water.

20 In Fig. 2 a substantially cylindrical metallic pipe 14 has been coated with a layer 16 of a cementitious composition comprising a hydraulic cement, a pozzolan and water. As in Fig. 1, the cementitious composition was applied in the form of a paste to form the layer 16 and was then left to set. The cementitious material cured while in contact with the internal surface of the pipe 14 and provides an alkaline environment in contact with the internal surface of the pipe 14. Once fully cured, the cementitious coating product protects the pipe 14 from electrochemical corrosion and also from leaching of the cement by drinking water.

The following examples illustrate the invention.

30 Example 1

Four cement compositions were prepared. One composition comprises

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100 wt% OPC. The other three compositions comprised: 90 wt% OPC, 10 wt% metakaolin; 80 wt% OPC, 20 wt% metakaolin; and 70 wt% OPC, 30 wt% metakaolin.

Each composition was mixed with water and sand at the sand:cement:water ratio 1:1:0.45.

Blocks of the cement were exposed to a low alkalinity water and the pH was monitored with time. There was a 24 hour retention time. The water hardness was 20mg/l as CaCO_3 . The results are shown in Fig. 3, from which it is clear that the compositions containing metakaolin performed much better than the other compositions.

Example 2

A cement composition was made comprising:

- (1) 20 wt% OPC to B.S. 12:1991 class 42.5N available from Blue Circle Industries.
- (2) 70 wt% GGBFS from Civil and Marine Slag Limited
- (3) 10 wt% metakaolin, grade Metastar 501 from English China Clay International (which is a particularly highly purified form of metakaolin).

Two ductile iron pipes of 100 mm diameter and 3 m total length were cut into 12 x 250 mm length sections. Each pipe was then in situ lined using standard small bore pipe rehabilitation equipment with the assistance of a local contractor. One pipe was lined with OPC blended with sand and water in the ratio 1:1:0.4. The second pipe was lined with the ternary composition according to the invention blended with sand and water in the ratio 1:1:0.43. The difference in water quantity was to produce optimum pump and surface finish properties.

After lining, the pipe sections were placed in airtight bags (to eliminate air circulation) with an environment humidity of about 62%, and were allowed to cure overnight at about 10°C for about 24 hours.

The effectiveness of the ternary blend was compared with the OPC

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over three different water hardnesses, and the results are shown in Figs 4 to 6. In each case the retention time was 8 hours. In Fig. 4 there was 10 mg/l as CaCO_3 , in Fig. 5 there was 35 mg/l as CaCO_3 and in Fig. 6 there was 55 mg/l as CaCO_3 . In each case the composition according to the invention resulted in significant

5 reductions in lime leaching.

It will be appreciated that the invention may be modified within the scope of the appended claims.

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Claims

1. A method of protecting a surface from corrosion, comprising applying to the surface a cementitious composition which, in the hardened state, acts as a low leaching coating in low alkalinity and low hardness waters.
2. A method according to claim 1, wherein the cementitious composition comprises at least one cement and a component which is capable of reacting with free lime.
3. A method according to claim 1 or 2, wherein the cementitious composition comprises at least one cement and a highly reactive pozzolan.
4. A method according to claim 3, wherein the pozzolan is metakaolin.
5. A method according to claim 3 or 4, wherein the composition comprises not more than 30 parts by weight pozzolan, based on the dry composition.
6. A method according to claim 3, 4 or 5, wherein the composition comprises not less than 5 parts by weight pozzolan, based on the dry composition.
7. A method according to claim 3, 4, 5 or 6, wherein the composition comprises not more than 10 parts by weight pozzolan, based on the dry composition.
8. A method according to any one of claims 2 to 7, wherein the cementitious composition further comprises a cement replacement material in an amount of not more than 70 parts by weight, based on the dry composition.
9. A method according to claim 8, wherein the cement replacement composition is ground granulated blast furnace slag and/or pulverised fuel ash.

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10. A method according to any one of claims 2 to 9, wherein the cement is a hydraulic cement.
- 5 11. A method according to claim 10, wherein the hydraulic cement is calcium silicate cement.
12. A method according to any preceding claim, wherein the cementitious composition further comprises aggregate.
- 10 13. A method according to any preceding claim, wherein the cementitious composition further comprises fibre reinforcement.
14. A method according to any preceding claim, wherein the cementitious composition further comprises water.
- 15 15. A method according to claim 14, wherein the cementitious composition comprises not more than 50 parts by weight water, based on the wet composition.
16. A method according to any preceding claim wherein the cementitious composition is mixed with sand to form a cementitious mortar composition, prior to being applied to said surface.
- 20 17. A method according to any preceding claim, wherein said surface is a metal surface.
- 25 18. A method according to any preceding claim, wherein said surface forms part of a pipe.
19. A method according to any preceding claim, wherein said cementitious composition is hardened after application to the surface.
- 30

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20. A cementitious composition comprising at least one cement in combination with metakaolin.

5 21. A composition according to claim 20, comprising not more than 30 parts by weight metakaolin, based on the weight of the dry composition.

22. A composition according to claim 20 or 21, comprising not more than 10 parts by weight pozzolan, based on the dry composition.

10 23. A composition according to claim 20, 21 or 22, further comprising a cement replacement material in an amount of not more than 70 parts by weight, based on the dry composition.

15 24. A composition according to claim 23, wherein the cement replacement composition is ground granulated blast furnace slag and/or pulverised fuel ash.

25. A composition according to any one of claims 20 to 24, wherein the cement is calcium silicate cement

20 26. A composition any one of claims 20 to 25, further comprising aggregate and/or fibre reinforcement.

27. A composition according any one of claims 20 to 26, further comprising not more than 50 parts by weight water, based on the wet composition.

25

28. A cementitious mortar composition comprising a mixture of cementitious composition according to any one of claims 20 to 27 and with sand.

30 29. A pipe comprising a hollow metallic conduit and a coating provided on an internal and/or external surface of the conduit, wherein the coating comprises a composition according to any one of claims 20 to 28.

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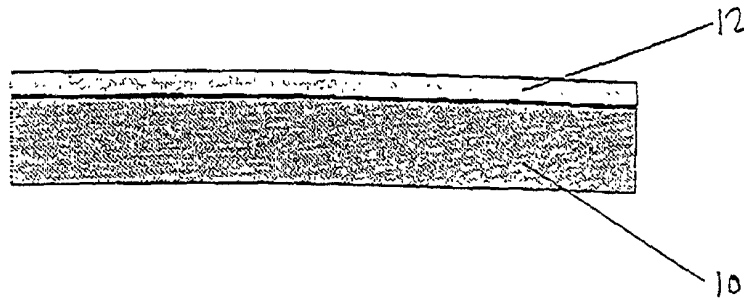


FIG. 1

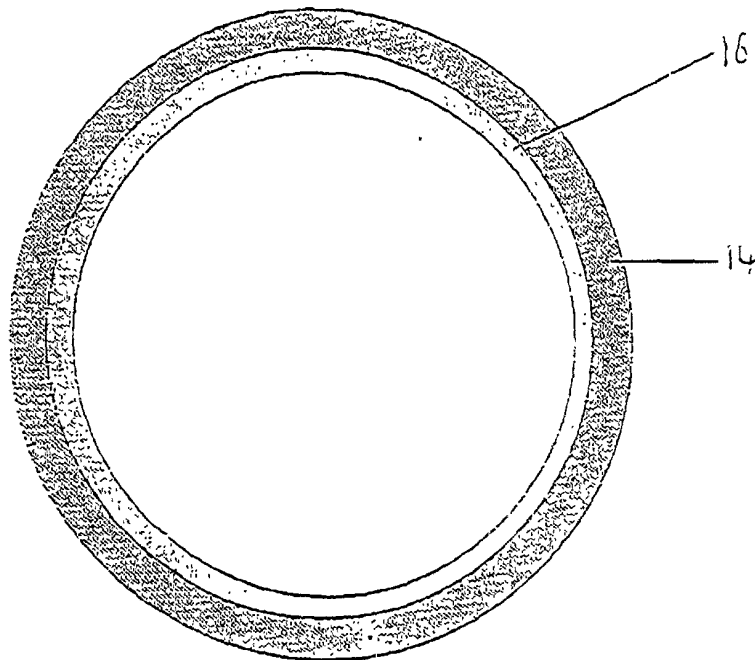
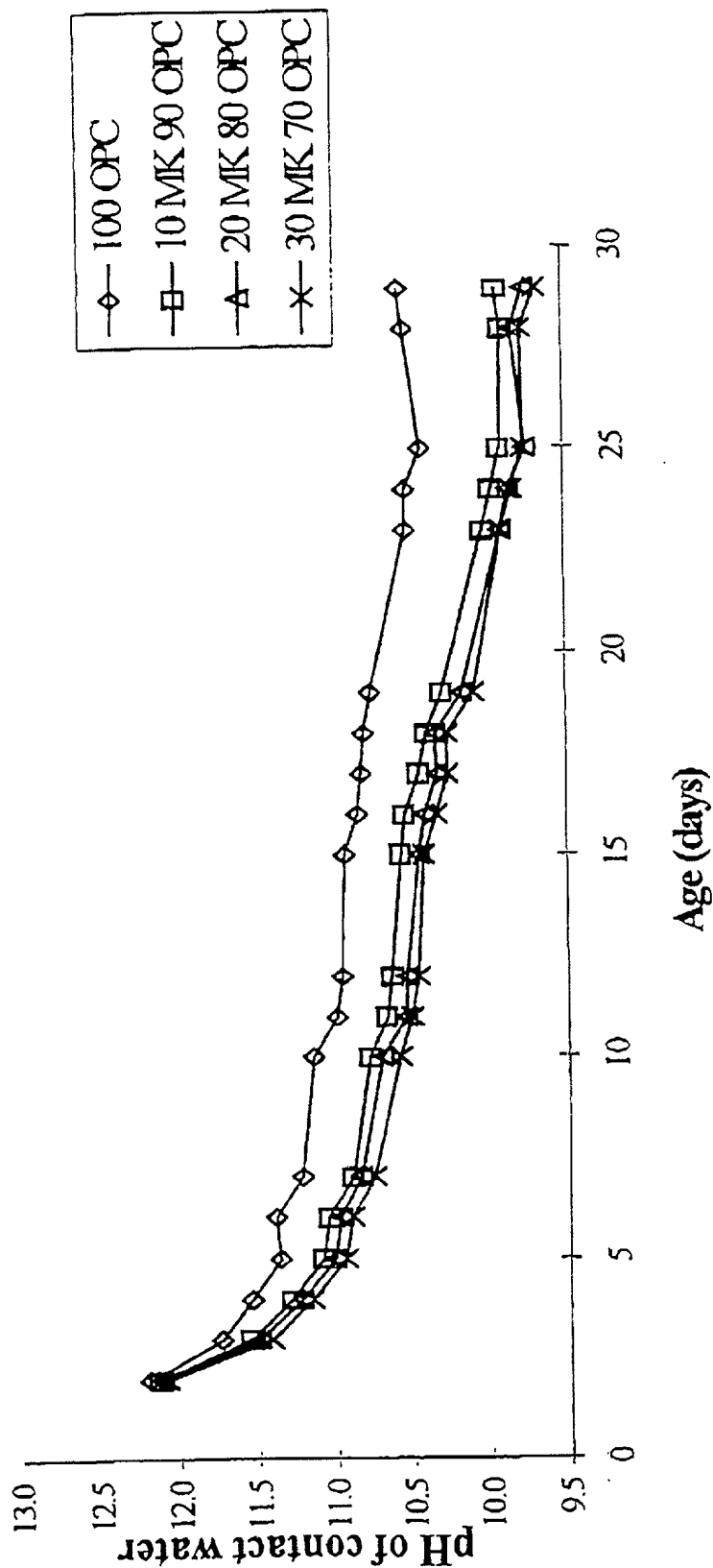


FIG. 2

2 / 5

FIG. 3



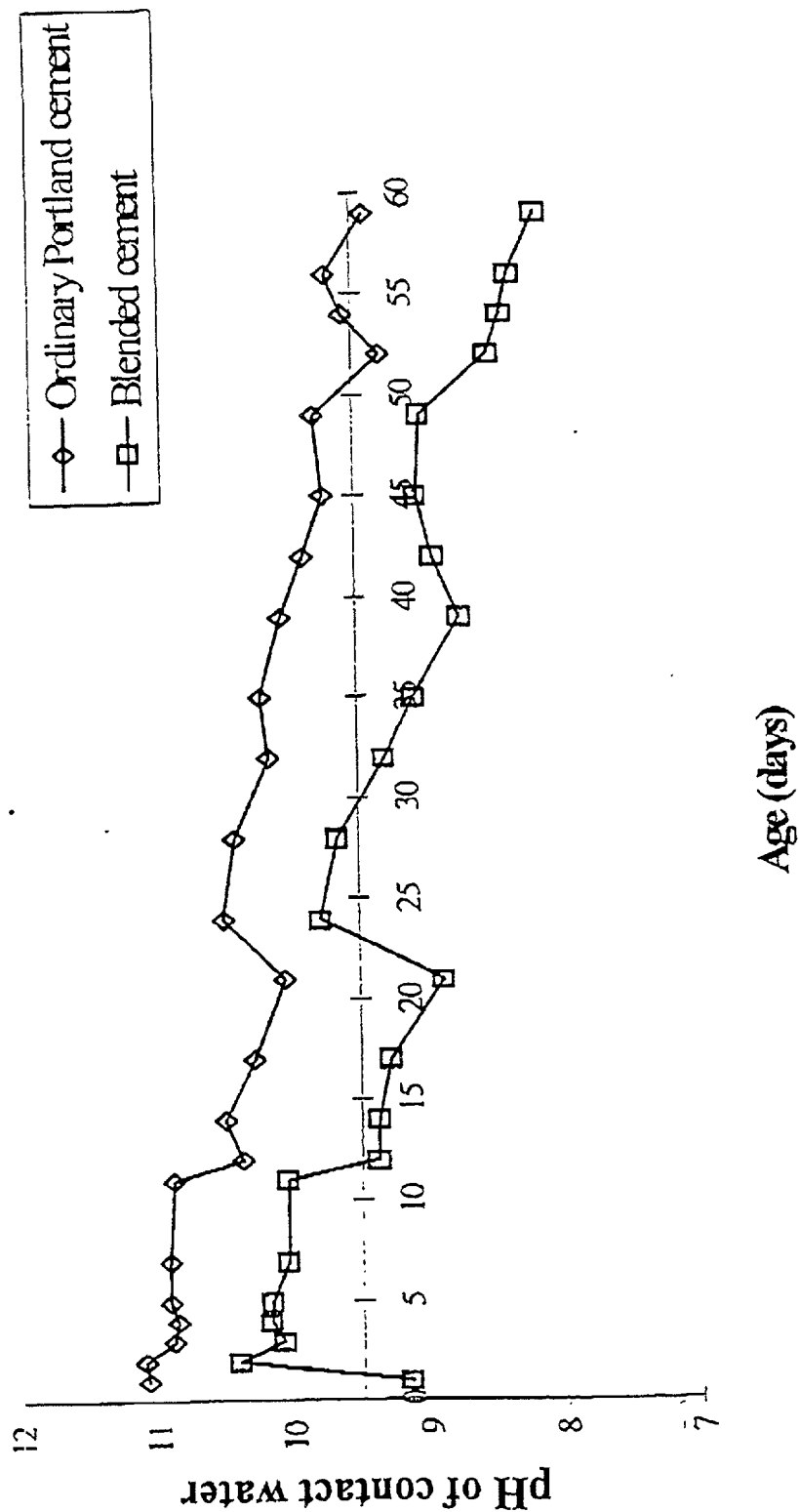
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FIG. 4



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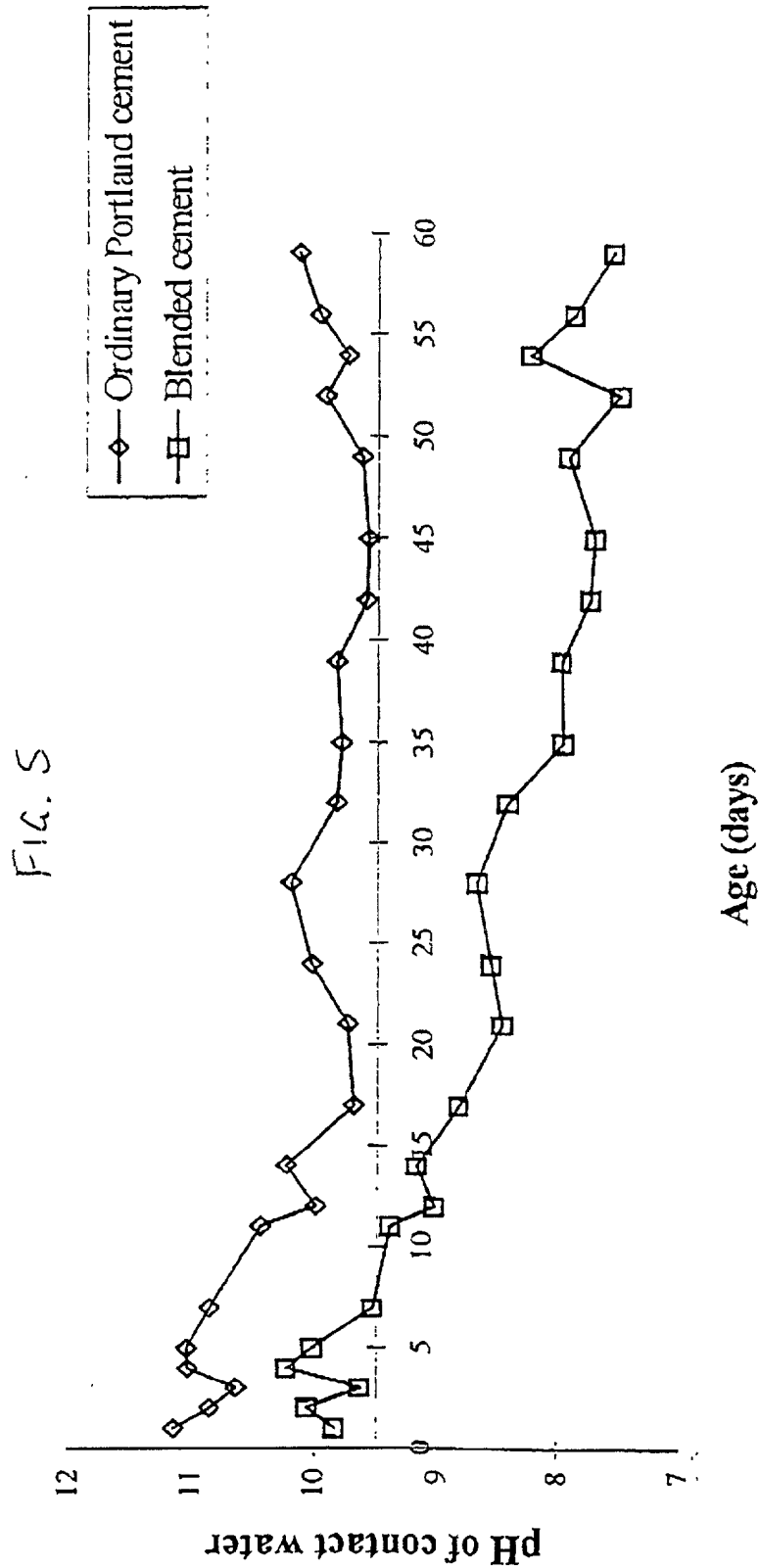
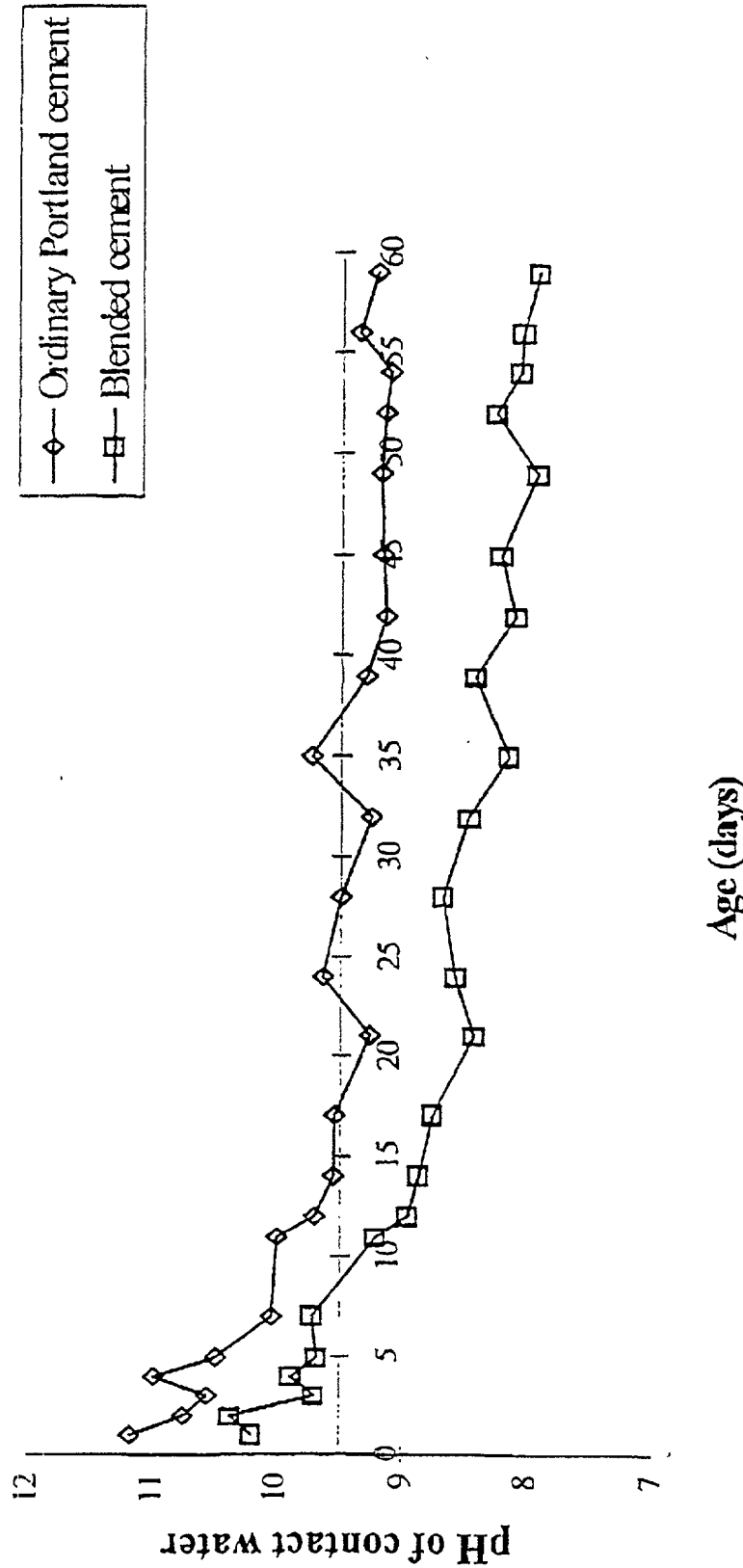


FIG. 6



COMBINED DECLARATION AND POWER OF ATTORNEY
FOR DESIGN PATENT APPLICATION

Attorney Docket No.

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;
that

I believe I am the original, first and sole inventor (if only one name is listed below)
or an original, first and joint inventor (if plural inventors are named below) of the subject
matter which is claimed and for which a design patent is sought on the invention entitled:

CEMENTITIOUS COMPOSITIONS AND THEIR USE IN CORROSION PROTECTION

the specification of which (check one)

☐ is attached hereto.

☐ was filed on _____ as Application Serial No. _____
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified
specification, including the claim, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this
application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I do not know and do not believe the claimed invention was ever known or used in the United
States of America before my or our invention thereof, or patented or described in any printed
publication in any country before my or our invention thereof or more than one year prior to
this application, that the same was not in public use or on sale in the United States of
America more than one year prior to this application, that the invention has not been
patented or made the subject of an inventor's certificate issued before the date of this
application in any country foreign to the United States of America on an application filed
by me or my legal representatives or assigns more than six months prior to this application.

I hereby claim foreign priority benefits under Title 35, United States Code §119 of any
foreign application(s) for patent or inventor's certificate listed below and have also
identified below any foreign application for patent or inventor's certificate having a filing
date before that of the application on which priority is claimed:

Prior Foreign Application(s):

Priority
Claimed

| (Number) | (Country) | Day/Month/Year Filed | Yes | No |
|-----------|---------------|----------------------|-------------------------------------|--------------------------|
| 9702119.0 | Great Britain | 1 February 1997 | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| (Number) | (Country) | Day/Month/Year Filed | <input type="checkbox"/> | <input type="checkbox"/> |
| (Number) | (Country) | Day/Month/Year Filed | <input type="checkbox"/> | <input type="checkbox"/> |

I hereby claim the benefit under Title 35, United States Code, §120 of any United States
application(s) listed below and, insofar as the subject matter of each of the claims of this
application is not disclosed in the prior United States application in the manner provided
in the first paragraph of Title 35, United States Code, §120, I acknowledge the duty to
disclose material information as defined in Title 37, Code of Federal Regulations, §1.55(a),
which occurred between the filing date of the prior application and the filing date of this
application:

| PRIORITY CLAIMED | | | | |
|----------------------|------------------|----------|---------|-----------|
| U.S. APPLICATION NO. | U.S. FILING DATE | PATENTED | PENDING | ABANDONED |
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I hereby appoint the following attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: Watson Cole Stevens Davis, P.L.L.C.; Robert J. Lasker, Reg. No. 22,785; Lawrence R. Radanovic, Reg. No. 23,077; Richard H. Tushin, Reg. No. 27,237; James E. Ledbetter, Reg. No. 28,732; Donald N. Huff, Reg. No. 27,561; Thomas P. Pavelko, Reg. No. 31,689; John P. DeLuca, Reg. No. 25,505; James A. Poulos, III, Reg. No. 31,714; Anthony P. Venturino, Reg. No. 31,674; Walter D. Ames, Reg. No. 17,913; and Ellsworth H. Mosher, Reg. No. 14,717. Direct all telephone calls to telephone no. (202) 628-0088 and faxes to (202) 628-8034.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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|---|--|-------------------------------|
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